DIFFERENT RESISTIVE PULSES IN A MICROPORE SYSTEM DEPENDING ON PARTICLE DRIVING FORCES

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Abstract - Resistive pulse sensing technology has been researched for a long time because of the extraordinary capability of sizing and characterizing very small particles that are from nanometer scale to micrometer scale. To explain the mechanism of this technology briefly, there are two chambers filled with electrolyte and connected to each other only through a small aperture manufactured on a dielectric membrane. Furthermore, there is an electrode inserted into the each chamber to provide potential difference over the system, which make almost constant current value over the system. When small particles that have comparable size with that of the aperture are introduced into a chamber (cis) and forced to be translocated to the other chamber (trans) through the aperture by either pressure or electrophoresis, this induces current drops by the partial blockages of the aperture by the particles that we can use to indirectly calculate the size of the particles. An interesting thing is that there is big difference between pressure driven translocation and electrophoresis driven translocation because of different ionic behaviors depending on the situations. For this reason, we have compared the resistive pulses resulted in by different driving forces and found how the ionic behaviors change and make effects on the resistive pulse depending on the system conditions. We have used surface modified polystyrene microparticles for the electrophoresis driven experiment, and neutral polystyrene microparticles and a syringe pump for the pressure driven experiment. Because the system was microscale, we assumed that the effects that the electrical double layer on the surface of the charged particles makes are ignorable.